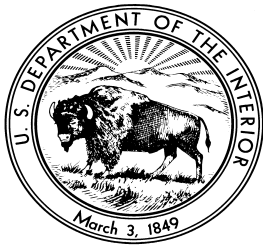


Materials Engineering & Research Laboratory FY2014 Geotechnical Laboratory Testing Capabilities



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Test	Test Standard		
	ASTM	USBR	Other
Soil Engineering Properties			
<i>Cyclic Testing</i>			
Determination of Modulus and Damping Properties, cyclic triaxial	D3999	-	
Cyclic Triaxial Soil Strength	D5311	-	
Determination of Modulus and Damping Properties, cyclic direct simple shear	-	-	
Cyclic Direct Simple Shear Soil Strength	-	-	
All cyclic testing available in both stress (load) and strain (displacement) control modes, frequencies up to 5 Hz, standard or user defined waveforms, post-cyclic monotonic strength available if required			
Triaxial Shear Strength			
Unconsolidated-Undrained (with or without saturation)	D2850	5745	
Consolidated-Undrained	D4767	5750	
Consolidated-Drained	D7181	5755	
Anisotropic and K_0 consolidation available, testing at prescribed OCR available	-	-	
6" Cell (up to 1" particle size) available if required	-	-	
Direct Shear Strength			
2"x2" or 4"x4" square box (standard machine), Consolidated-Drained	D3080	5725	
Up to 12" x 12" square box (large machine), Consolidated-Drained	D3080	5725	
Repeated Direct Shear available if required	-	5726	
Slurry specimen prep for fully softened strength or residual strength available if required			
Geosynthetic-Soil Interface (4"x4" through 12"x12")	D5321	5725var	
Other Strength Tests			
Residual (Rotational) Shear Strength	-	5730	
Simple Shear Strength	D6528	-	
Unconfined Compressive Strength	D2166	5720	
Consolidation/Swell Testing			
1-D Swell/Collapse Consolidation	D4546	5705/5715	
1-D Incremental Loading	D2435	5700	
Permeability Testing			
Constant Head Permeability & Settlement, 8" diameter	-	5600	
Constant Head Permeability & Settlement, 19" diameter	-	5605	
Flexible Wall Permeameter (back pressure, triaxial cell)	D5084	5610	
Dispersion/Erosion Potential			
Pin-hole Method	D4647	5410	
Double Hydrometer	D4221	5405	
Crumb Test	D6572	5400	
Jet Erosion Test	D5852		
Hole Erosion Test	-	-	



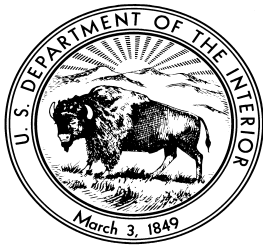
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Test	Test Standard		
	ASTM	USBR	Other
Soil Physical & Index Properties			
<i>Grain Size Analysis</i>			
Gravel Sizes (3" to #4 sieve size)	D422	5325	
Standard sand sieves + hydrometer	D422	5330	
Percent Passing #200 sieve	D1140	5335	
<i>Specific Gravity</i>			
Specific Gravity, - #4 sieve size	D421	5320	
Specific Gravity, + #4 sieve size	D854	5320	
<i>Organic Content</i>			
Loss on Ignition	D2974	5430	
Oven-Dried Liquid Limit	D4318	5350	
<i>Atterberg Limits</i>			
Plastic Limit + 1-point Liquid Limit	D4318	5350, 5360	
3-point Liquid Limit available if required	D4318	5355	
Shrinkage Limit	D4943	5365	
<i>Moisture and Density</i>			
Natural (as received) Moisture Content	D2216	5300	
As-received Density, tube sample	-	5372	
As-received Density, irregular/block sample	-	5375	
Laboratory Compaction, Standard Effort (cohesive soil)	D698	5500	
Laboratory Compaction, Modified Effort (cohesive soil)	D1557	-	
Maximum Index Density via Vibrating Hammer (granular soil)	D7382	-	
Correction for oversize materials (all compaction tests)	D4718	5515	
<i>Rapid Tests</i>			
Laboratory Vane Shear	D4648	5765	
Torvane (handheld) Shear	-	5770	
Pocket Penetrometer	-	-	
Angle of Repose	-	5380	
Other Soil Tests			
<i>Granular Filter Material Testing</i>			
Performance / Compatibility Testing (NEF/CEF)	-	5630	
Cementation potential via UCS	D2166var	-	
Cementation potential via Modified Sand Castle Test	-	-	
<i>Soil-Cement (some tests also applicable to soil-lime)</i>			
Mix Design	-	5805	
Laboratory Compaction	D558	5800	
Repeated Wetting & Drying Durability	D559	5815/5820	
Compressive Strength	D1632/1633	5810	
Triaxial Shear	-	-	
Flexural Strength	D1632/1635	-	
Freeze/Thaw Durability	D560	5825	

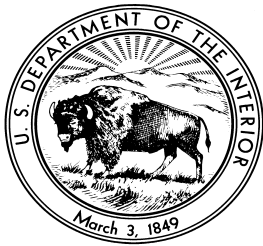


Materials Engineering & Research Laboratory FY2014 Geotechnical Laboratory Testing Capabilities



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Test	Test Standard		
	ASTM	USBR	Other
Other Soil Tests, Continued			
Concrete Aggregate and Filter Material Quality Testing			
Percent Passing #200 sieve	C117	4117	
Gradation - Coarse or Fine Aggregate	C136	4136	
Specific Gravity & Absorption - Coarse Aggregate	C127	4127	
Specific Gravity & Absorption - Fine Aggregate	C128	4128	
Organic Impurities	C40	4040	
Clay Lumps & Friable Particles	C142	4142	
Flat & Elongated Particles	D4791	4903	
L.A. Abrasion - Small	C131	4131	
L.A. Abrasion - Large	C535	4535	
Sodium Sulfate Soundness	C88	4088	
Rock Strength			
Compression Testing			
Specimen Preparation (Saw Cutting, Grinding, Tolerance Check)	D4543	-	-
Uniaxial Shear	D7012	6210	-
Triaxial Shear	D7012	-	-
Multi-Staged Triaxial	-	-	COE 204-80
Stress-strain measurements, testing at elevated temperatures, and pore water pressure measurements available if required			
Direct Shear Testing			
Small Direct Shear (Max. 7-inch circular area)	D5607	6250	-
Large Direct Shear (Max. 12-inch circular area)	D5607	6250	-
Portable Direct Shear	-	6255	-
Tilt Table	-	6258	-
Tension Testing			
Indirect Splitting Tension	D3967	6235	-
Direct Tension	D2936	6230	-
Other Rock Tests			
Point Load Test	D5731	6535	-
Ultrasonic Pulse Velocity & determination of Elastic Constants	D2845	6120	
Slake Durability tests on weak rock	D4644	6260	-
Free Swell and Uplift and expansion test for swelling rock	D4546	6265	ISRM
Estimating Compressive Strength by Schmidt Hammer Test	-	6538	ISRM
Freeze/Thaw Durability of Rock for Erosion Control	D5312	-	
Rock Physical & Index Properties			
Bulk Density (as-received)	-	6110	ISRM
Water Content	D2216	5300	ISRM
Specific Gravity, Porosity and Absorption (complete physical properties suite)	D6472	6110	ISRM
Waxed Density (specimens susceptible to water)	-	5375	



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Test	Test Standard		
	ASTM	USBR	Other
Petrographic Analysis			
<i>Soil Examinations</i>			
Clay Mineralogy Investigations	-	-	-
Petrographic Riprap Evaluation	D4992	6025	
Petrographic Evaluation of Aggregates for use in Concrete	C295	4295	
<i>Rock Examinations</i>			
Post-test (after break) failure mode determination	-	-	-
Rock Type & Mineralogical description	-	-	-
Sample Storage (beyond duration of testing program, for additional fee)			
In humidity room (70% humidity, 70F)	-	-	
Climate Controlled Building	-	-	
Ambient Conditions (warehouse)	-	-	

Notes:

1. Please contact MERL personnel for assistance preparing Field Exploration Request and other cost estimates, and when designing field and lab testing programs.
2. Please inquire about tests not appearing on this sheet - MERL personnel are available to accommodate all testing needs. Testing according to custom or modified procedures can be performed, and MERL personnel can work to develop new test methods.
3. Performing the same test on multiple samples can often reduce costs - please inquire with MERL personnel.
4. All test results and computations are checked and peer reviewed.
5. Results and recommendations are typically conveyed in a technical memorandum from MERL personnel. Results are presented graphically when possible and color photographs of pre- and post-test specimens are included in appendix when appropriate.